CLAIMS

1. An angular velocity sensor comprising:

a tuning fork vibrator including

a first vibrating arm having a first end and a second end, the first vibrating arm having a fundamental vibration frequency,

a second vibrating arm having a first end and a second end, the second vibrating arm having the fundamental vibration frequency, and

a coupling portion for coupling the first end of the first vibrating arm to the first end of the second vibrating arm;

a drive unit provided on the first vibrating arm, for causing the first vibrating arm to vibrate, the drive unit having a driving resistance; and

a detection unit provided on one of the first vibrating arm and the second vibrating arm, for detecting an amount of deflection of the one of the first vibrating arm and the second vibrating arm when deflecting due to an angular velocity applied to the tuning fork vibrator,

wherein a ratio R1/R2 is smaller than "1", where R1 is the driving resistance at the fundamental vibration frequency, and R2 is the driving resistance at a vibration frequency different from the fundamental vibration frequency.

2. The angular velocity sensor according to claim 1, wherein, the first vibrating arm has nodes at the first end and at a point between the first end and the second end when the first vibration arm vibrates at the frequency different from the fundamental frequency.

3. The angular velocity sensor according to claim 1, wherein the drive

unit includes

a first electrode provided on the first vibrating arm from the first end of the first vibrating arm toward the second end of the first vibrating arm,

a piezoelectric layer provided on the first electrode from the first end of the first vibrating arm toward the second end of the first vibrating arm, and

a second electrode provided on the piezoelectric layer from the first end of the first vibrating arm toward the second end of the first vibrating arm, the second electrode having a length (D) in a direction from the first end of the first vibrating arm toward the second end of the first vibrating arm, wherein the first vibrating arm has a length (L) from the first end thereof to the second end thereof, and satisfies a relation of $0.38<D/L<0.46$.

4. The angular velocity sensor according to claim 1, wherein the detection unit includes

a first electrode provided on the one of the first vibrating arm and the second vibrating arm from the first end of the one of the first vibrating arm and the second vibrating arm toward the second end of the one of the first vibrating arm and the second vibrating arm,

a piezoelectric layer provided on the first electrode from the first end of the one of the first vibrating arm and the second vibrating arm toward the second end of the one of the first vibrating arm and the second vibrating arm, and

a second electrode provided on the piezoelectric layer from the first end of the one of the first vibrating arm and the second vibrating arm

toward the second end of the one of the first vibrating arm and the second vibrating arm, the second electrode having a length (D) in a direction from the first end of the one of the first vibrating arm and the second vibrating arm toward the second end of the one of the first vibrating arm and the second vibrating arm, wherein the one of the first vibrating arm and the second vibrating arm has a length (L) from the first end thereof to the second end thereof, and satisfies a relation of $0.38<D/L<0.46$.

5. The angular velocity sensor of claim 1 further comprising an auxiliary weight unit provided on the first vibrating arm and between the drive unit and the second end of the first vibrating arm, the auxiliary weight unit being separated from the drive unit and the detection unit.

6. The angular velocity sensor of claim 1, wherein the additional weight unit has a shape which can be adjusted to control vibration directions of the first vibrating arm and the second vibrating arm.

7. A method for designing an angular velocity sensor which includes

a tuning fork vibrator including

a first vibrating arm having a first end and a second end, and having a fundamental vibration frequency,

a second vibrating arm having a first end and a second end, and having the fundamental vibration frequency, and

a coupling portion for coupling the first end of the first vibrating arm to the first end of the second vibrating arm,

a drive unit provided on the first vibrating arm, for causing the first vibrating arm to vibrate, the driving unit having a driving resistance,

and

a detection unit provided on one of the first vibrating arm and the second vibrating arm, for detecting an amount of deflection of the one of the first vibrating arm and the second vibrating arm when deflecting due to an angular velocity applied to the tuning fork vibrator,

said method comprising:

determining a size of the first vibrating arm; and

determining a size of the drive unit so that a ratio R1/R2 is smaller than "1", where R1 is the driving resistance at the fundamental vibration frequency, and R2 is the driving resistance at a frequency different from the fundamental vibration frequency.

8. The method according to claim 7, wherein, the first vibrating arm has nodes at the first end and at a point between the first end and the second end when the first vibration arm vibrates at the frequency different from the fundamental frequency.

9. The method according to claim 7,

wherein the drive unit includes

a first electrode provided on the first vibrating arm from the first end of the first vibrating arm toward the second end of the first vibrating arm,

a piezoelectric layer provided on the first electrode from the first end of the first vibrating arm to the second end of the first vibrating arm, and

a second electrode provided on the piezoelectric layer from the first end of the first vibrating arm to the second end of the first

vibrating arm, the second electrode having a length (D) in a direction from the first end of the first vibrating arm to the second end of the first vibrating arm,

wherein the first vibrating arm has a length (L) from the first end thereof to the second end thereof, and

wherein said determining the size of the drive unit comprises determining the length D of the drive unit to satisfy the relation of $0.38<D/L<0.46$.